



CST 283

Programming Assignment 8

Winter 2024
Instructor: T. Klingler

Objective

This program will provide an opportunity to solve a problem related to queuing simulations.

Overview & Instructions

Write a computer simulation to measure working time for a retail store checkout area.

Assume customers complete their shopping and then seek a checkout line to pay. Constraints and variables for this simulation are:

- The simulation timer should be seconds. Consider all events that could occur during one second of the work day.
- The store has three checkout lines. Allow the simulation to be set to run with 1, 2, or 3 open.
- All the settings for customer arrivals at the checkout area range from a very slow probability of 1 in 360 seconds to an extremely (and perhaps unrealistically) busy 1 every 10 seconds.
- Execute your simulation for an entire 12-hour work day: 43200 seconds
- If the number of queues exceeds one, a prudent customer will always select the shortest one to enter. Be sure to include this in your simulation.

Your simulation output should include the following:

- Average customer wait time (for each queue as well as further averaged for all customers)
- Idle time for workers (for each worker managing a queue as well as for all workers during the day)

To facilitate easy execution of your simulation, package your simulation within its own class and then utilize a GUI “front-end” driver. Your GUI should include at least the following:

- Radio button or similar component to allow selection of 1, 2, or 3 open lines
- A slider to vary customer arrival frequency
- A text area or labels to clearly show the simulation results.
- A button to launch the simulation with given parameters

Finally, to add more variability and realism to the scenario, don't assume that all customers require the same amount of checkout time once they are dequeued and on the checkout conveyor. Instead set a randomly-chosen variable time for checkout with the assumption that 20% of customers will require very little time checking out (1 minute), 60% will require a medium amount of checkout time (two minutes), and 20% will require a long time (five minutes). These can be set as constants, but it is also optional to allow these constraints to be entered via your user interface.

Note: The provided *dynamic* queue class is recommended for this exercise. Be sure to verify your implementation of the queue class includes the capability of reporting the length of a queue.

Deliverables

Demonstrate the development steps of your program with at least two version commits to the assignment Git repository.

Deliver the following to the eLearning system **Assignment Dropbox** as your final product:

- **Upload** your **source code** (.java) file(s); preferably zipped in more than one file
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